Configuration Management News

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Configuration Management of Commercial-Off-The-Shelf (COTS) Products

By Cecil West, ASO-471 & John Steele, ANS-110

The Department of Transportation (DOT) has implemented several regulations concerning acquisition management. The FAA Administrator has complied with this direction by implementing the FAA Acquisition Management System (AMS), which addresses the unique needs of the agency and, at a minimum, provides for more timely and cost-effective acquisitions.

Section 3 of the AMS contains our new procurement policy. The goal of the FAA procurement system is to obtain high quality products, services, and real property in a timely, cost-effective manner, at prices that are fair and reasonable. A fundamental principle of our new procurement system encourages the procurement of commercial and non-developmental items. Systems procured in this manner are often referred to as commercial-off-the-shelf (COTS) products. COTS equipment and software are normally designed and manufactured to "best commercial practices" and because they are competition and marketplace driven are often state-of-the-art designs. Cutting edge technology has an increasing shorter half-life. Thus, using COTS products enables the FAA to apply or "refresh" technology without modifying the basic acquisition documents.

There are significant Configuration Management (CM) factors that must be considered in the acquisition and use of COTS products throughout the National Airspace System (NAS) Life Cycle. Commercial vendors are not mandated to apply CM standards uniformly and many work to industry standards which are voluntary compliance documents. The Electronic Industry Association document (EIA-649, National Consensus Standard for Configuration Management) provides CM principles and best practices, however each vendor will only apply those principles and practices, which they perceive are in their own best interests. Some vendors have well established CM processes while others have minimal CM processes in place.

While for COTS there is less data required to be placed under CM, there are more complexities introduced into the FAA's engineering processes. These complexities involve such issues as the identification, operation and maintenance, replacement, and discontinuance of COTS items and obsolescence of their spare parts.

There are four basic tenets of Configuration Management: Configuration Identification, Configuration Control, Status Accounting, and Auditing. Configuration Identification is essential in a COTS environment, especially, if we are to have an opportunity to perform the other CM tenets.

Configuration Identification There are three areas that need to be addressed for configuration identification of COTS. They are: acquisition documentation, performance baseline, and item identification.

COTS (continued from page 1)

Acquisition Documentation The selection of the appropriate specification document types is dependent upon a number of factors such as the maturity of the item, and the context and environment in which it must operate. The choice of the most appropriate documentation to use for acquisition of a COTS item varies according to the product end use, supportability requirements, system complexity, and many other factors.

Requirements in performance based specifications shall describe what is required or the item's form, fit, function, and interface requirements. Performance based specifications shall not describe how a requirement is to be achieved, require the use of specific materials or parts, or give detailed design or construction requirements beyond those needed to ensure interchangeability with existing items.

Documentation of COTS products is unregulated; therefore, its availability, consistency, and information content may be inconsistent and unpredictable. Data rights are generally not available for use in product design and modification. Additional data required for COTS should be limited to that which is normally provided to commercial buyers. Such data typically includes operating instructions, basic maintenance instructions and parts replacement, **which if performed by the user will not invalidate the product warranty**. Any additional data can be expensive and is generally unnecessary. Bringing commercial design documentation up to government standard levels, as was often done in the past is a cost that must be avoided. Much of this data can be quickly out-of date. As long as the item meets the verifiable performance requirements, and is supportable in the field using an inventory of spare parts designated by the COTS supplier, the design details should be left to the supplier.

An example of a non-government documentation source would be standards or specifications published by industry associations or societies recognized as standards making bodies by the American National Standards Institute (ANSI), which define minimum acceptable performance and quality, or precise interface requirements for a category of product. Examples of non-government associations are American Society of Mechanical Engineers (ASME), Society of Automotive Engineers (SAE), Electronic Industry Association (EIA); example of performance/quality standard is SAE 30 Motor Oil; examples of standard interface are electronic connectors, screw thread sizes.

Typically the Integrated Product Team (IPT) prepares a Commercial Item Description (CID) which defines the acquisition performance requirements by form, fit, function, and interface requirements.

Commercial Item Descriptions (CID) are standard purchase descriptions that by definition are performance-based because they facilitate competitive bid for products meeting a stated functional requirement. Also, commercial product descriptions (such as a manufacturer's catalog or specification sheet) and commercial purchase descriptions (item descriptions spelled out directly in a purchase order) qualify under this category.

Specific requirements for the development of a performance-based specification can be found in MIL-STD-961D "Department of Defense Standard Practice for Defense Specifications" and MIL-HDBK-61 "Military Handbook Configuration Management Guidance".

Performance Baseline The use of COTS conforms to the AMS environment when performance documentation is used to specify and manage form, fit, function, and interface requirements. With performance-based acquisition the FAA must specify and control an item to the item's performance-based specifications rather than to the detail design documentation. Therefore, the only documentation that should be baselined is the performance-based specifications or equivalent documents. The COTS vendor will often establish design and product baselines for their own use. Controlling these baselines at the performance and interface/interchange-ability level allows the COTS vendor to make engineering changes necessary for technical refreshment and to avoid obsolescence.

Additional data required for COTS should be limited to that which is normally provided to commercial buyers. Such data typically includes operating instructions, basic maintenance instructions, and parts replacement, which if performed by the FAA will not invalidate the product warranty.

Item Identification There is little consistency in item identification practices among COTS vendors and often little consistency between two products of the same vendor.

The FAA must compensate for inconsistencies and poor practices by the COTS vendors. Such remedies include ancillary identifiers (alias) at the time of incoming inspection for inventory control, asset management, serialization, configuration control, and status accounting.

Configuration Control When it comes to managing COTS items the performance specification, including interface requirements (performance baseline), is the key to effective configuration control. The FAA typically does not have rights to the design data of a COTS vendor and cannot direct changes to it.

COTS (continued from page 2)

The FAA may request the vendor to make changes to its product; however, the FAA does not have the right to direct a change if the vendor is not in agreement.

Due to the nature of various CIs and the vendor's standard practices the configuration control requirements will vary from vendor to vendor. Where possible the COTS performance-based specification vendor configuration control requirements should include advance notification of design changes that may impact the performance baseline, advance notification of pending obsolescence, and advance notification of changes to field repairable/replaceable assemblies and spare parts.

Configuration Status Accounting (CSA) The FAA's Configuration Status Accounting (CSA) process is the place where the reconciliation between inconsistent vendor CM practices and clear accountability must take place.

The purpose of CSA is to assure accurate identification of each CI and delivered unit so that the necessary logistics support elements can be correctly programmed and made available in time to support the CI. An accurate CSA will enhance the program manager's capabilities to identify, produce, inspect, deliver, operate, maintain, repair, refurbish, etc., CIs in a timely, efficient, and economical manner in satisfying their assigned responsibilities.

All of the other CM activities provide information to the status accounting data base as a by-product of transactions that take place as the functions are performed. Aided or facilitated by the documented CM process and open communications, this activity provides the visibility into status and configuration information concerning the product and its documentation. Metrics (performance measurements) on CM activities are generated from the information in the CSA data base and provided to the CM Management function for use in monitoring the process and in developing continuous improvements.

The FAA assigned identifier (alias) for the COTS part can be used to achieve supply support stability by building an interchangeable alternate part database as the COTS item changes as a result of product/vendor discontinuance and upward compatible vendor changes.

Configuration Audits Configuration Verification and Audit uses schedule information from CSA, documentation, identification, the results of product testing, and the physical hardware or software product or its representation, manufacturing instructions, and the software engineering environment to verify that the product's performance requirements have been achieved by the product design. The audit also ensures the product design has been accurately documented in the configuration documentation. This process is also applied to verify the incorporation of approved engineering changes. Successful completion of verification and audit activities results in a verified product and documentation set that may be confidently considered a systems/facility baseline, as well as a validated process that will maintain the continuing consistency of products to documentation.

The Configuration Audit is comprised of the Functional Configuration Audit (FCA) and the Physical Configuration Audit (PCA).

Functional Configuration Audit (FCA) The FCA is conducted to determine whether or not the actual performance of each CI complies with its controlling specifications. Specifically, an FCA must verify that the functional baseline is consistent and the functional requirements are traceable as shown through the documentation and test results.

The FCA will vary according to the type of CIs being audited. Note that for a complex CI, the FCA may be conducted on a progressive basis throughout the CI's development. The FCA will culminate at the completion of the qualification testing of the item with a review of all discrepancies at the final FCA. Also, for performance parameters that cannot be completely verified during testing, adequate analysis or simulations must be accomplished.

The FCA should normally be completed prior to accomplishing the PCA.

Physical Configuration Audit (PCA) The PCA is a formal examination of CIs and technical documentation to ensure that the technical documentation and the as-built CIs match. Successful completion of the PCA is a prerequisite to establishment of the product baseline. After PCA, all subsequent changes are processed via an NCP.

Software Control

Special consideration should be given to the types of product baselines that need to be established and maintained on COTS software integration projects.

- COTS Contractor needs to establish and maintain a software product baseline that provides integrity for the contractual developmental effort.
- A unique baseline for each installation should be established to account for hardware and software environment differences created by the use of multiple revision levels of COTS products at each location.
- Software should be held in escrow in case vendor goes out of business.

COTS (continued from page 3)

Vendor Source Selection CM should be an integral part of the COTS vendor source selection process. CM issues need to be addressed in the vendor and product selection processes particularly as they relate to training, maintenance, and logistic support. Market surveys in preparation for acquiring COTS should include CM related questions similar those listed below to give the CM organization insight into the vendor's CM practices. Quite often CM can become a COTS vendor source selection discriminator.

COTS Supplier Market Analysis Questionnaire

Ref: MIL-HDBK-61

1. Do you have a viable engineering drawing and part numbering system?
2. What is your method of re-identifying parts when changes are made?
3. How do you relate part number changes to the serial numbers of the deliverable item?
4. How do you manage item modifications?
5. How do you inform your own personnel and customers of changes to your product?
6. Do you currently operate using all or any portions of any recognized CM standard?
7. Do you employ a formal change review process?
8. Do you operate a change control board?
9. A Material Review Board?
10. How do you assure the currency, integrity, and consistency of:
    - ♦ Material Specifications
    - ♦ Drawings
    - ♦ Indentured Lists
    - ♦ Parts Lists
    - ♦ Service Manuals
    - ♦ Operating Manuals
11. Do you have a release procedure for documentation? Explain.
12. Do you apply serial numbers and or lot numbers to your products?
13. How are they assigned and marked?
14. By what methods do you assure that products delivered to your customers comply with the customers' order and specification?
15. What type of communication relative to change activity do you have with your suppliers?
16. Do you ever install refurbished components in your products?
17. If a product line is dropped, when is a customer notified?
18. What options are offered the customer?
19. If a component that is supplied to the customer as a spare part is being changed, how and when is the customer notified?
20. How do you support your products?
21. What options are typically available to the customer?

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Benefits of Placing COTS Products Under Configuration Management

By: National CM Process Team

- Provides the framework to establish the Performance Baseline.
- Provides the ability to manage the form, fit, function, and interface requirements (Performance Baseline).
- Provides the capability to verify that the COTS Product Performance Requirements have been met and the product is suitable for its intended use.
- Provides insight as to when the COTS vendor may be planning to introduce a product upgrade.
- Documents necessary information for maintenance.
- Documents necessary information for supply support in terms of spares and repair parts.
- Documents necessary information to establish and document the training program.
- Documents necessary information to establish and maintain the system test bed.
- Reduces system downtime by enhancing the maintenance, training, and supply support of the system.
- Provides the means to reduce life-cycle costs and improve safety through the accurate identification of product change impacts.
- Provides the framework to technically assess whether or not the FAA would want to or be able to accept a COTS Product upgrade.
- Provides the capability to know and understand what changes have been issued against a COTS Product (Planned Modifications).
- Provides the capability to know what modifications have been implemented.
- Provides requirements traceability.
- Provides for accurate system and product testing/impact assessment across multiple system baselines caused by the rapid evolution of vendor controlled products.

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Closure of CCD's

A **Configuration Control Decision (CCD)** is the record of a decision reached on a proposal to baseline a CI or to change a baselined CI. A CI is an aggregation of hardware/software/ firmware, or any of its discrete portions, which satisfies an end-use function and is designated by the FAA for CM. CIs defined in FAA Order 1800.8 for regional control include: space utilization, critical power, site adaptation (including environmental), region unique equipment and regionally tailored construction specifications as stated in the RCCB charters. Also, the FAA defines space as a CI. Approved CCDs assign actions to implement the proposal or change to a specific CI. CCDs are prepared on FAA Form 1800-49, Configuration Control Decision.

In order for us to close a CCD we must have something to tell us that the project has actually been completed. When it comes to closing CCD's that something is page 2 of the CCD completed with the signatures of the individuals who performed the actions described in block 7 of the CCD.

The agency currently has 12,000 open CCD action items (there are usually several for each CCD). If you know you have completed a project, please check to see if a CCD is involved. If there is a CCD, check to ensure the assigned actions are completed and please sign in the appropriate place (call your regional CM representative if necessary) and return the paperwork to your regional CM representative. Please don't forget to place a copy of the CCD in the Facility Reference Data File (FRDF).

Management of the CCD closure task is important because effective management of changes minimizes schedule and cost impact. Undocumented changes may cause a system to fail because all of the impacts of a new or future change are not properly assessed. Additionally, it makes it impossible to incorporate new changes into already produced products. Undocumented changes also make it difficult for the end user to maintain the product or make additional upgrades. These actions are closely related to the recent activity concerning the modification database and updates to Maintenance Management System (MMS).

Managing the configuration of space within a facility helps us plan for future projects and avoids those cost associated with reverse engineering of the facility every time a modernization project or new program is considered. In short, Configuration Management has a direct impact on our primary customer, the flying public. CM represents a considerable cost savings to the agency.

Reminders

The case file/NCP needs to be developed and approved before the work is accomplished. Remember, waivers are not an option (FAA Order 6000.20B, *Waiver of Criteria for Establishment and Maintenance of Airway Facilities* has been canceled). The NCP process helps to ensure coordination between the various engineering disciplines and provides valuable managerial insight into program status.

Ordering Documentation

You no longer have to use DOCCON to order documents from the Document Control Center (DCC) in Washington. Order your documents through cc:Mail by forwarding your request directly to the DCC. Your message should be addressed to: **9 DCC SETA**. The message should fully describe the document you are requesting and please don't forget to provide your mailing (postal) address.

Reasons for Configuration Management

We are very often asked why we bother with Configuration Management (CM) and what do we hope to accomplish by processing all this paper? Wouldn't these things just happen anyway? Of course they will, especially in an organization full of experienced people with good functional interfaces, clearly understood procedures and the latest automated tools and facilities. Unfortunately, we don't have all of these things all of the time, so we must work together and communicate our requirements and especially our priorities. Configuration Management is about ensuring good coordination. By performing good CM we ensure things just happen.

The following benefits can be derived from proper CM activities.

- Facilities, Equipment and Technical information source for Engineers, Managers and Technicians
- Coordinated allocation of valuable facility space
- Reduces relocation and re-installation costs
- Eliminates need for lengthy site visits
- Reduces A&E costs to bring documentation up to date
- Reduces Contractor costs resulting from use of out of date or incorrect information
- Formalized NCP process ensures coordination of engineering and maintenance concerns.

Talk to your regional CM representative about establishing good CM processes.

Announcements

Central Region reports the baselining of the Kansas City, MO ATCT. This brings the Central Region percentage of completion to **58.82 %**.

Southern Region reports the baselining of the San Juan, Puerto Rico ATCT. This brings the Southern Region percentage of completion to **58.11 %**. The Southern Region currently has drawing redlines for 10 other facilities in CAEG. The addition of these sites will bring their percentage to **71.62 %**. In an effort to ensure the accuracy of Southern Region CM drawings they have commenced auditing facilities under CM. Audits were completed for Greer, SC ATCT; Wilmington, NC ATCT; Myrtle Beach, SC ATCT; and the Miami, FL ARTCC.

Western Pacific Region reports the baselining of the Santa Barbara, CA ATCT. This brings the Western Pacific Region percentage of completion to **41.79 %**.

The addition of these facilities brings the national percentage of completion to **53.18 %**.

Certification Received

Wendy Pierce has successfully completed her coursework from the Configuration Management Training Foundation (CMTF). She has received her certification as a Certified International Configuration Manager (CICM).

SPECIAL THANKS

Configuration Management is vital to the successful implementation of the NAS. Through the efforts of several individuals the program is making great strides toward fulfilling established goals. The CM Program would like to thank those individuals whose assistance has been invaluable during the past months.

Thanks for a job well done.

Barbara McNerney, ANI-500 NISC
Al Rapp, ANI-458
Vince Siciliano,ANI-458
Don Sarkinen, DMS-SMO
Jobi Kennedy, AGL-471
Kelly Faison, ASD-220
Larry Leifried, DTS SMO

Extra Stuff

If you have **Microsoft Internet Explorer 4.0** installed on your computer clicking on an embedded link (the underlined blue type) will take you to the web site for that link.

FAA iCMM article in the November issue of *CrossTalk* by Linda Ibrahim.
http://stsc.hill.af.mil/CrossTalk/1998/nov/nov98ind.html

FAA iCMM Intranet Site.
SEPG (iCMM)

AOS Intranet Site.
AOS Information & Technical Documentation

Enroute IPT Intranet Site
AUA-200

External CM Sites
Office of the Secretary of Defense
Navy CM
EIA
SEI
IPD CM Architecture
International Society of Configuration Management
CM & Training Foundation

Welcome

ANM 471 is pleased to inform you about a new employee to the Operations Section. His name is Kelly Ford. Kelly will be handling ANM Must Evaluations, IRR's, and eventually the tower baseline program. Kelly's telephone number is (425) 227-2366 and his FAX number is (425) 227-1403 or 1830.

Regional CM Representatives

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